Planning a Federal DER Project: Steps in the Process

Distributed Energy Resources for Federal Facilities

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Objective

To assist Federal Facility Managers in the selection, installation and operation of Distributed Energy Resources at their sites.

Goals:

- ☺ Become knowledgeable about DER and energy-efficiency technologies.
- ☺ Maximize economy and efficiency of facility.
- ☺ Save energy and money.

Seven Steps to Success

1. Analyze the facility's electric needs.
2. Select candidate DER technologies.
3. Screen technologies for feasibility.
4. Acquire project and financial resources.
5. Develop a project plan.
6. Address potential barriers.
7. Install and operate the DER.

Step 1: Analyze the Facility's Electric and Other Energy Needs

Current Energy Data:

- Recent bills, fuel costs
- Any "sensitive" or mission critical loads
- Seasonal needs
- CHP opportunities

Step 1: Analyze the Facility's Electric and Other Energy Needs (cont'd.)

DER Applications:

- Standby Power
- Low-Cost Energy
- Stand-Alone Systems
- Combined Heat and Power (CHP)
- Peak Shaving
- Improved Reliability and Power Quality (PQ)
- "Green" Power

Step 2: Select Candidate DER Technologies

Become familiar with DER that may fit your facility's energy needs.

- Diesel and Natural Gas Engines
- Combustion Turbines
- Microturbines
- Fuel Cells
- Photovoltaic (solar) systems
- Wind Turbines
- Storage and Hybrid Systems

DER Applications Matrix

Technology		Application					
		Standby Power	Low-cost Energy	Stand-alone System	Combined Heat & Power	Peak Shaving	Power Quality
Energy Generation	Diesel Engine	✓	✓	✓	✓	✓	
	Natural Gas Engine	✓	✓	✓	✓	✓	
	Dual Fuel Engine	✓	✓	✓	✓	✓	
	Microturbine	✓		✓	✓	✓	
	Combustion Turbine	✓	✓	✓	✓	✓	
	Fuel Cell		*	✓	✓	✓	
	Photovoltaics		*	✓		✓	
	Wind Turbine		*	✓			
Energy Storage	Uninterruptible Power Supply (UPS)	✓					✓
	Battery System	✓					✓
	Flywheel						✓
	Superconducting Magnetic Energy Storage (SMES)						✓
	Hybrid Systems	✓	✓	✓	✓	✓	✓

DER Cost and Performance

Technology	Size Range kW	Installed Cost $/kW (2)	Heat Rate Btu/kWh	Approx. Efficiency %	Variable O&M $/kWh	Emissions (1) lb/kWh	
						NO_x	CO_2
Diesel Engine	1-10,000	350-800	7,800	45	0.025	0.017	1.7
Natural Gas Engine	1-5,000	450-1,100	9,700	35	0.025	0.0059	0.97
Natural Gas Engine w/CHP (3)	1-5,000	575-1,225	9,700	35	0.027	0.0059	0.97
Dual Fuel Engine	1-10,000	625-1,000	9,200	37	0.023	0.01	1.2
Microturbine	15-75	950-1,700	12,200	28	0.014	0.00049	1.19
Microturbine w/CHP (3)	15-75	1,100-1,850	12,200	28	0.014	0.00049	1.19
Combustion Turbine	300-10,000	550-1,700	11,000	31	0.024	0.0012	1.15
Combustion Turbine w/CHP (3)	300-10,000	700-2,100	11,000	31	0.024	0.0012	1.15
Fuel Cell	100-250	5,500+	6,850	50	0.01-0.05	0.000015	0.85
Photovoltaics	0.01-8	8,000-13,000	--	N/A	0.002	0.0	0.0
Wind Turbine	0.2-5,000	1,000-3,000	--	N/A	0.010	0.0	0.0
Battery	1-1,000	1,100-1,300	--	70	0.010	(4)	(4)
Flywheel	2-1,600	400	--	70	0.004	(4)	(4)
SMES	750-5,000	600	--	70	0.020	(4)	(4)
Hybrid Systems	1-10,000	(6)	(5)	(5)	(5)	(5)	(5)

Notes:

(1) Nationwide utility averages for emissions from generating plants are 0.0035 lb/kWh of NOx and 1.32 lb/kWh of CO2.

(2) The high end of the range indicates costs with NOx controls for the most sever emissions limits (internal combustion technologies only).

(3) Although the electric conversion efficiency of the prime mover does not change, CHP signficantly improves the fuel utilization efficiency of a DER system.

(4) Storage devices have virtually no emissions at the point of use. However, the emissions associated with the production of the stored energy will be those from the generation source.

(5) Same as generation technology selected.

(6) Add cost of component technologies.

Step 3: Screen the DER Technologies

Rule out those technologies that are not practical or feasible at your site.

- Electrical demand
- Fuel availability and supply
- Physical size limitations
- Air/environmental impacts
- First-cut cost: capital and life-cycle
- Anticipate barriers (see Step 6)

Step 4: Acquire Project Resources

Line up the technical, financial and personal resources that will help you get the job done.

- **Process Experts -** check with your DOE Regional Office representative and FEMP DER Program
- **Technical Experts -** DOE, FEMP, Nat. Labs, local utilities, ESCOs, consultants & vendors
- **Financial support -** Utility Energy Services Contracting, Energy Savings Performance Contracting, utility rebates, state/Federal incentive programs
- **FEMP DER Program -** technical and financing assistance, education and outreach

Step 5: Develop a Project Plan

Outline the specific technical, business and financial approach your project needs

- Conduct a **Preliminary Screening**, with guidance from FEMP and DOE Regional Office
- Conduct a **Full-Scale Feasibility Study**
- Explore **Financing Options**, using the resources described in Step 4.
- Obtain the necessary **Permits**, including air and land use, as required.
- Apply for **Interconnections** with the local utility, including electric and gas, as needed.
- Prepare **RFP** to select qualified contractor.

Step 6: Address Potential Barriers

Identify obstacles and delays to your project and formulate strategies for overcoming them.

- Identify a **point of contact with the utility** and work closely with them throughout the interconnection process.
- Learn from experiences of **other DER projects in your area**
- See if your DER hardware can qualify as **certified equipment.**
- Find out about **air emissions regulations** and what data and forms are required to be filed.
- Require the **contractor** to handle all permitting, studies, etc. when signing a contract.

Step 7: Install and Operate the DER

- Improved facility operations: reliability, power quality, energy security
- Money saved
- Environmental impacts lessened
- Beneficial impact to the local utility grid

Selected Resources

DOE Federal Energy Management Program (FEMP)
www.eren.doe.gov/femp

DOE Regional Offices
www.eren.doe.gov/femp/aboutfemp/fempcontacts.html.#regional

Building Life-Cycle Cost Tool (BLCC)
www.eren.doe.gov/femp/techassist/softwaretools/softwaretools.html

DOE Software and Analytical Tools
www.eren.doe.gov/buildings/tools_directory/

DOE Office of Distributed Energy and Electric Reliability
www.eren.doe.gov/der

FEMP How-To Guide
Numerous additional sources of information and assistance.